US009083114B2

(12) **United States Patent**
Muro

(10) **Patent No.: US 9,083,114 B2**
(45) **Date of Patent: Jul. 14, 2015**

(54) **CONNECTOR**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 61 days.

(21) Appl. No.: **14/006,374**

(22) PCT Filed: **Jun. 22, 2012**

(86) PCT No.: **PCT/JP2012/066053**

§ 371 (c)(1),
(2), (4) Date: **Sep. 20, 2013**

(87) PCT Pub. No.: **WO2012/176898**

PCT Pub. Date: **Dec. 27, 2012**

(65) **Prior Publication Data**

US 2014/0011388 A1 Jan. 9, 2014

(30) **Foreign Application Priority Data**

Jun. 24, 2011 (JP) 2011-140766

(51) **Int. Cl.**
H01R 13/627 (2006.01)
H01R 13/436 (2006.01)

(52) **U.S. Cl.**
CPC ***H01R 13/627*** (2013.01); ***H01R 13/4362*** (2013.01)

(58) **Field of Classification Search**
CPC H01R 13/4362; H01R 13/627
USPC 439/752
See application file for complete search history.

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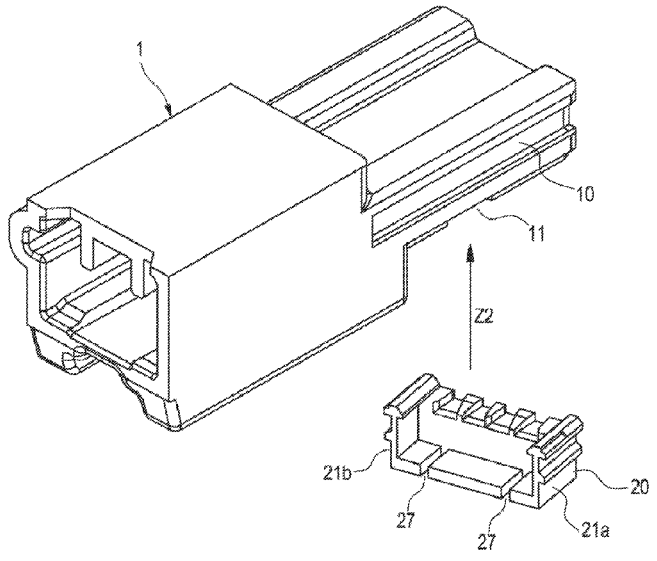
(57) **ABSTRACT**

A connector includes a connector housing that receives a terminal fitting, a spacer that is inserted into a spacer installation opening of the connector housing to prevent the terminal fitting received in the connector housing from being fallen out, a temporary locking mechanism that temporarily fixes the spacer to a temporary locking position where the spacer is not engaged with the terminal fitting, a main locking mechanism that locks the spacer pushed toward a more inner side of the housing than the temporary locking position to a main locking position where the spacer is engaged with the terminal fitting. The temporary locking mechanism allows the spacer to move from the temporary locking position to the main locking position.

2 Claims, 17 Drawing Sheets



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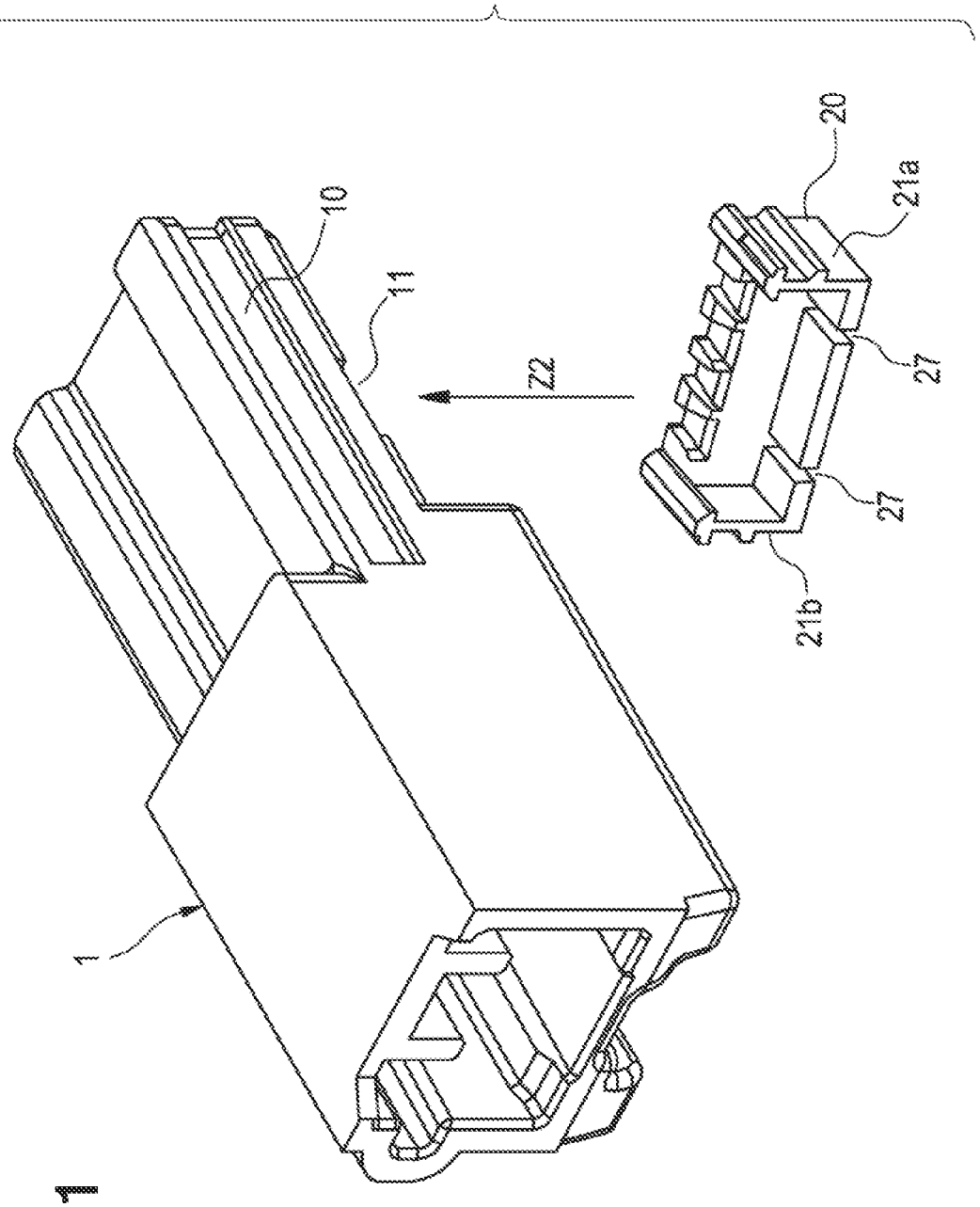


FIG. 1

FIG. 2

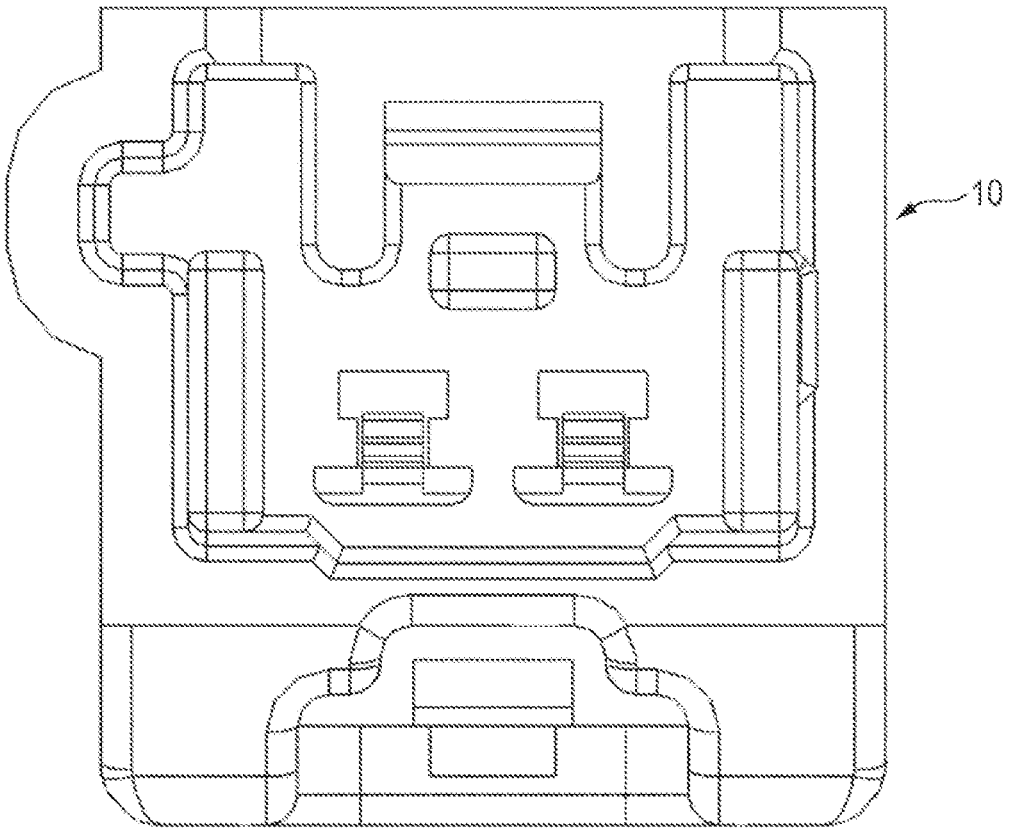


FIG. 3

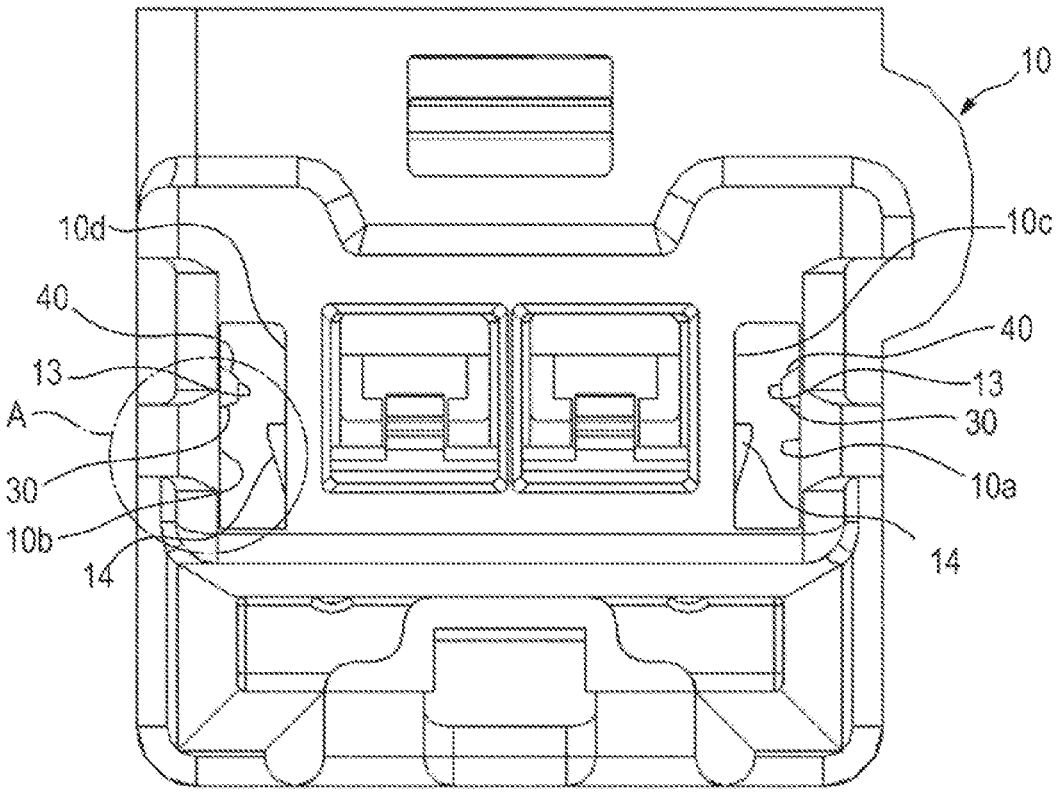
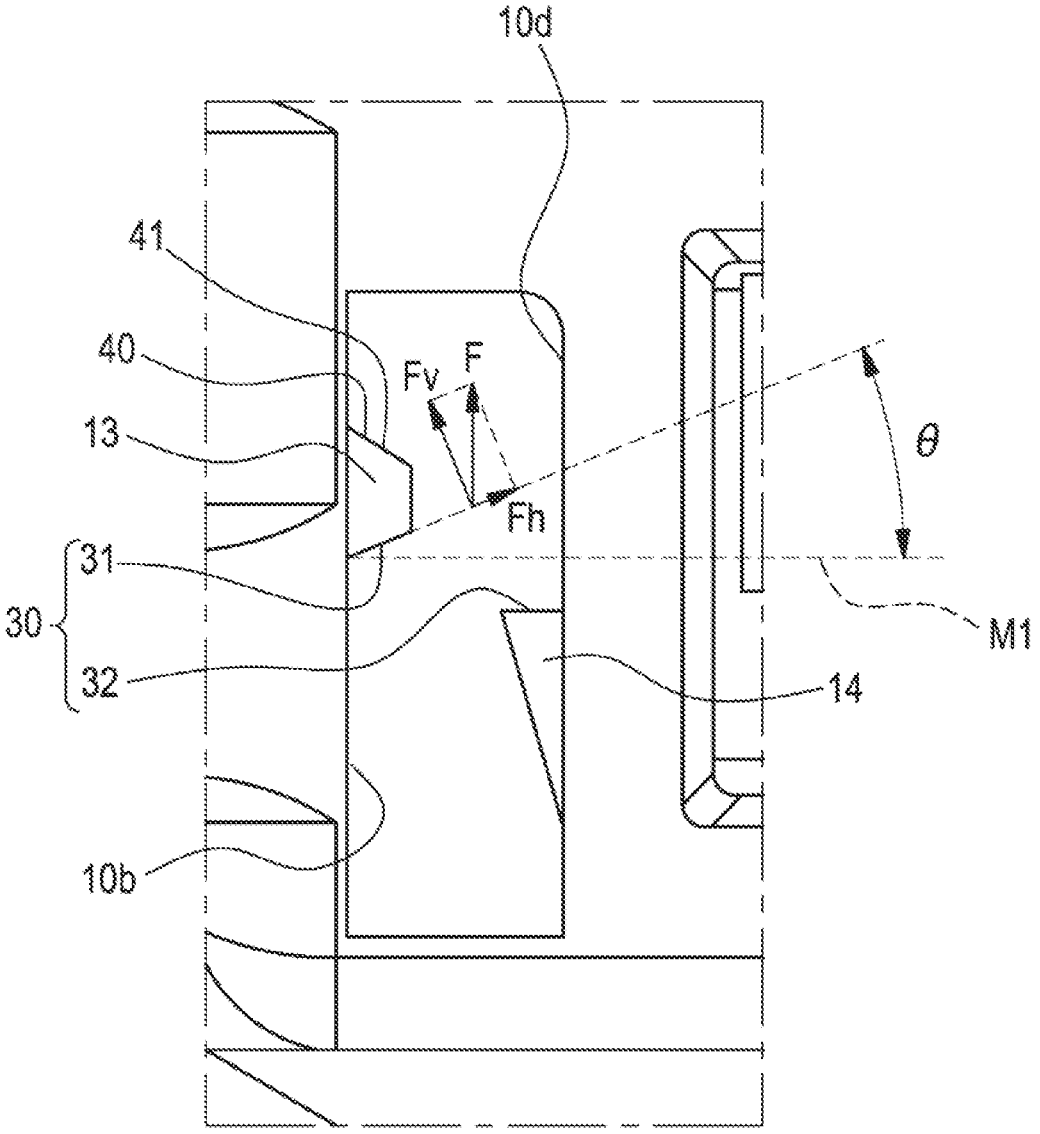


FIG. 4



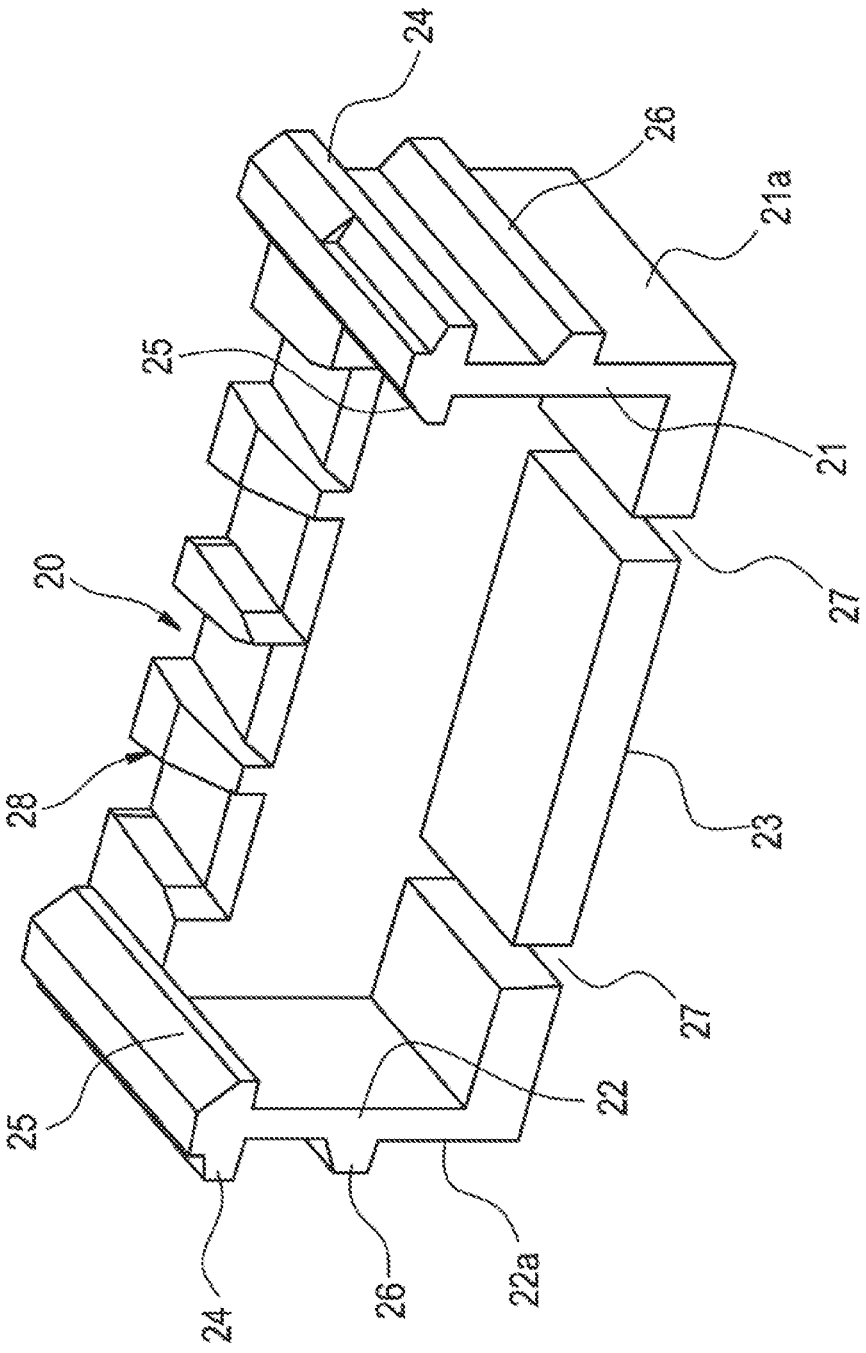


FIG. 5

FIG. 6

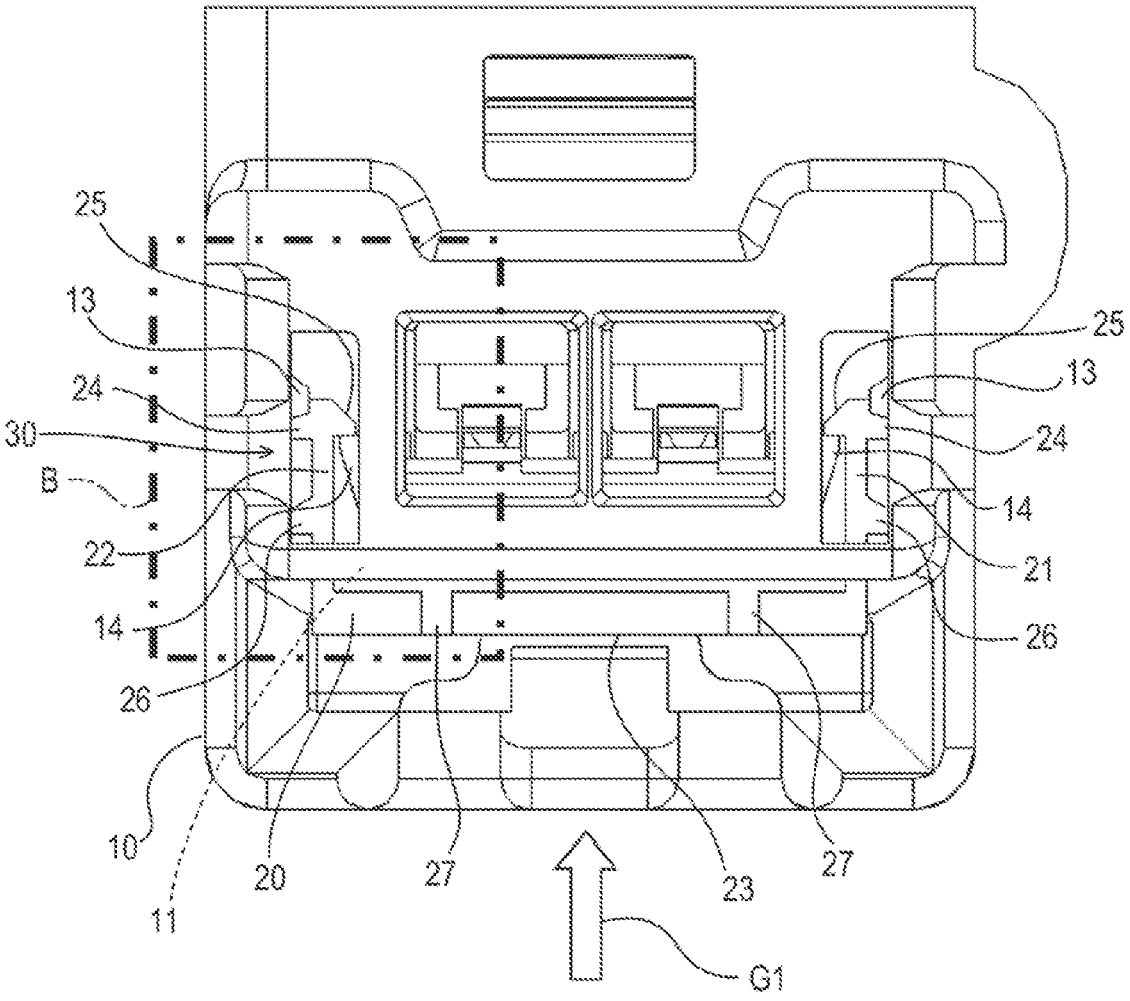


FIG. 7

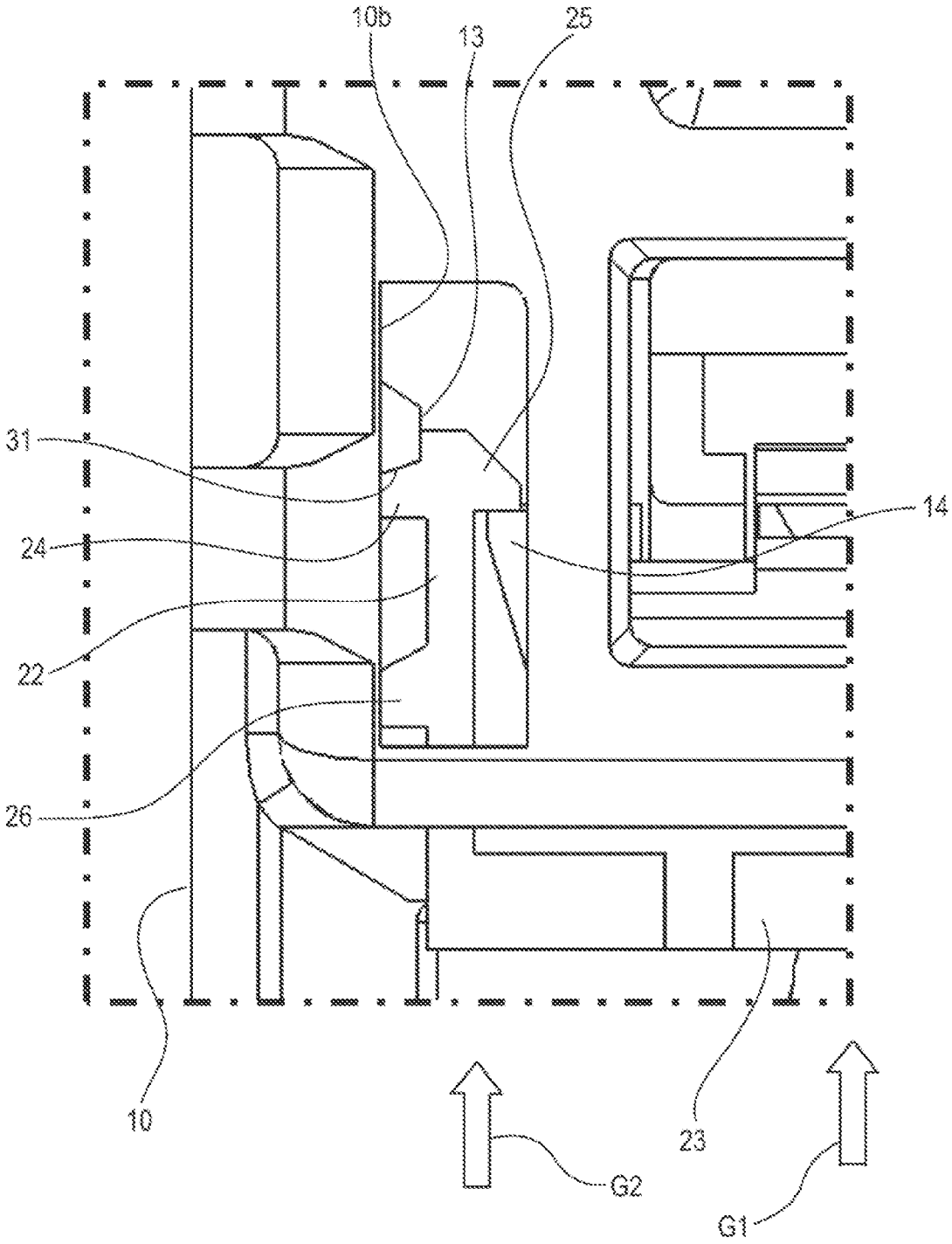


FIG. 8

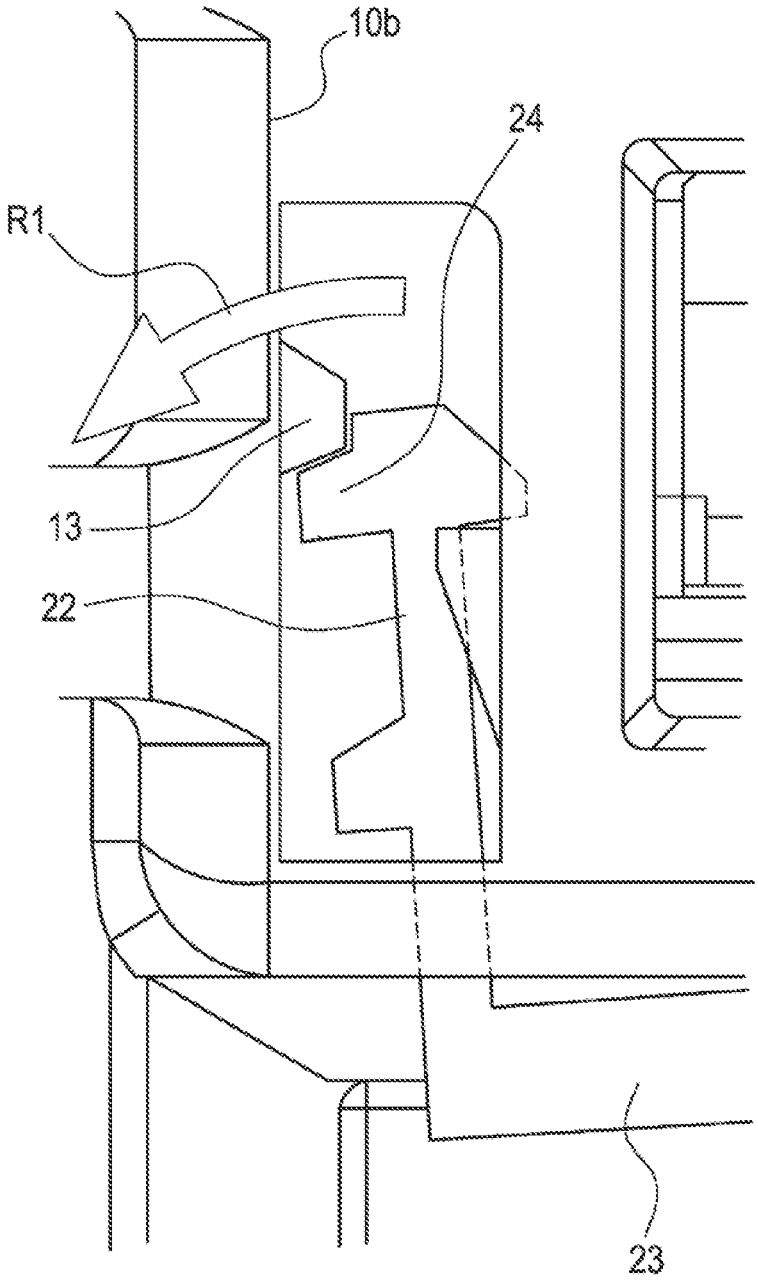


FIG. 9

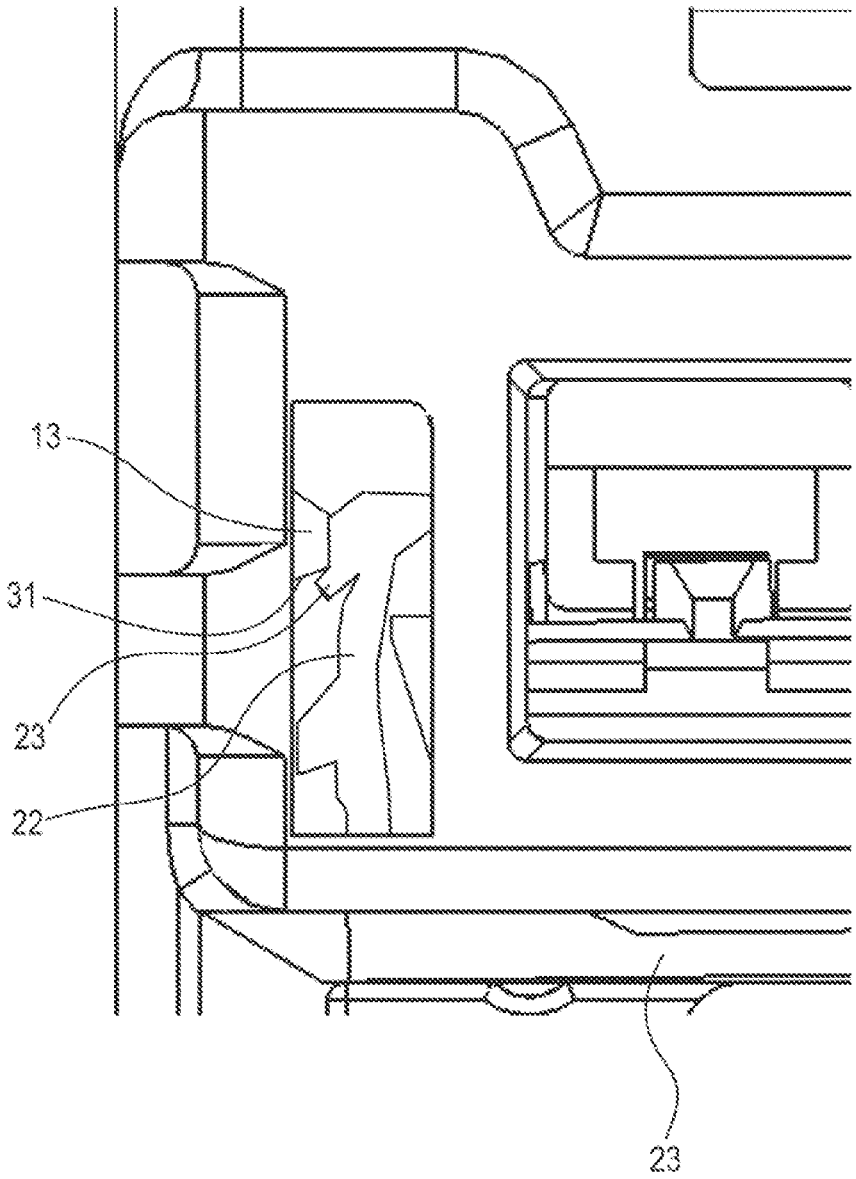


FIG. 10

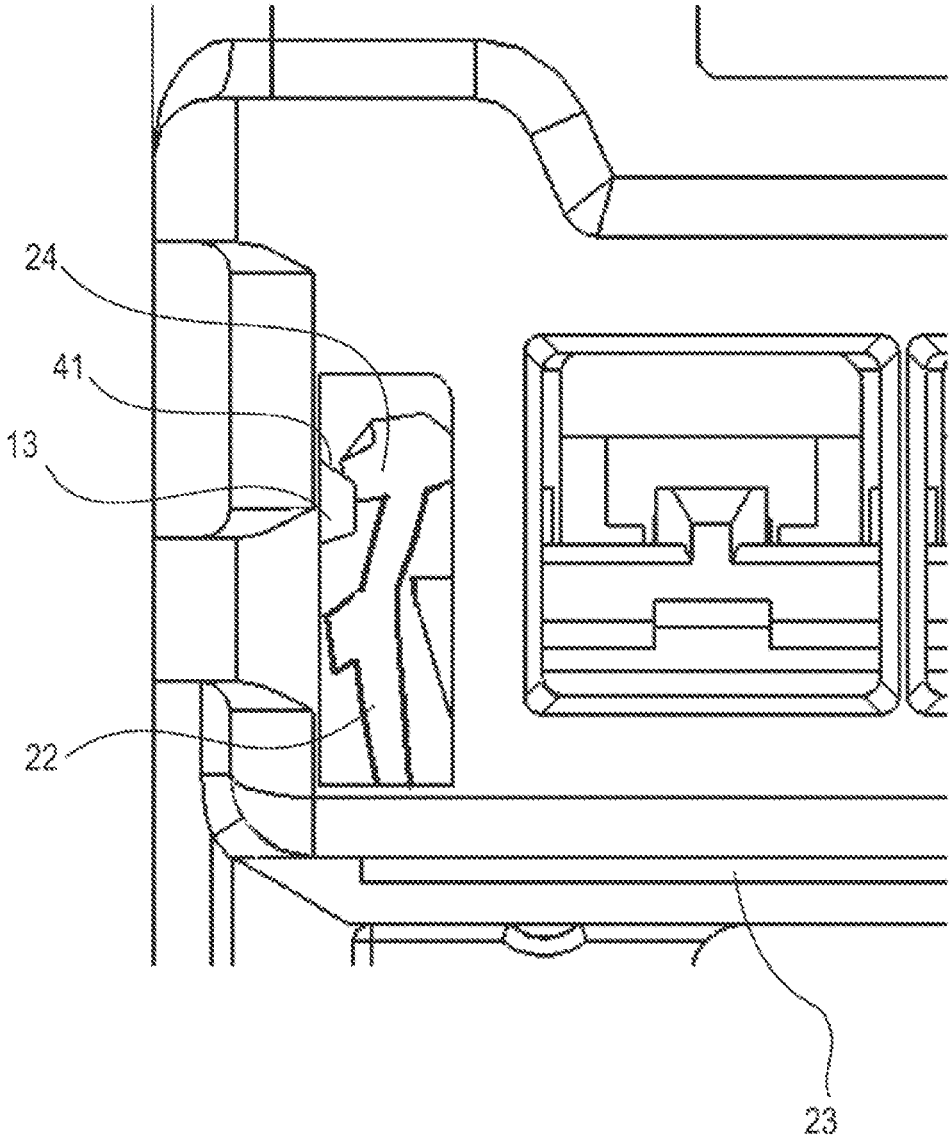
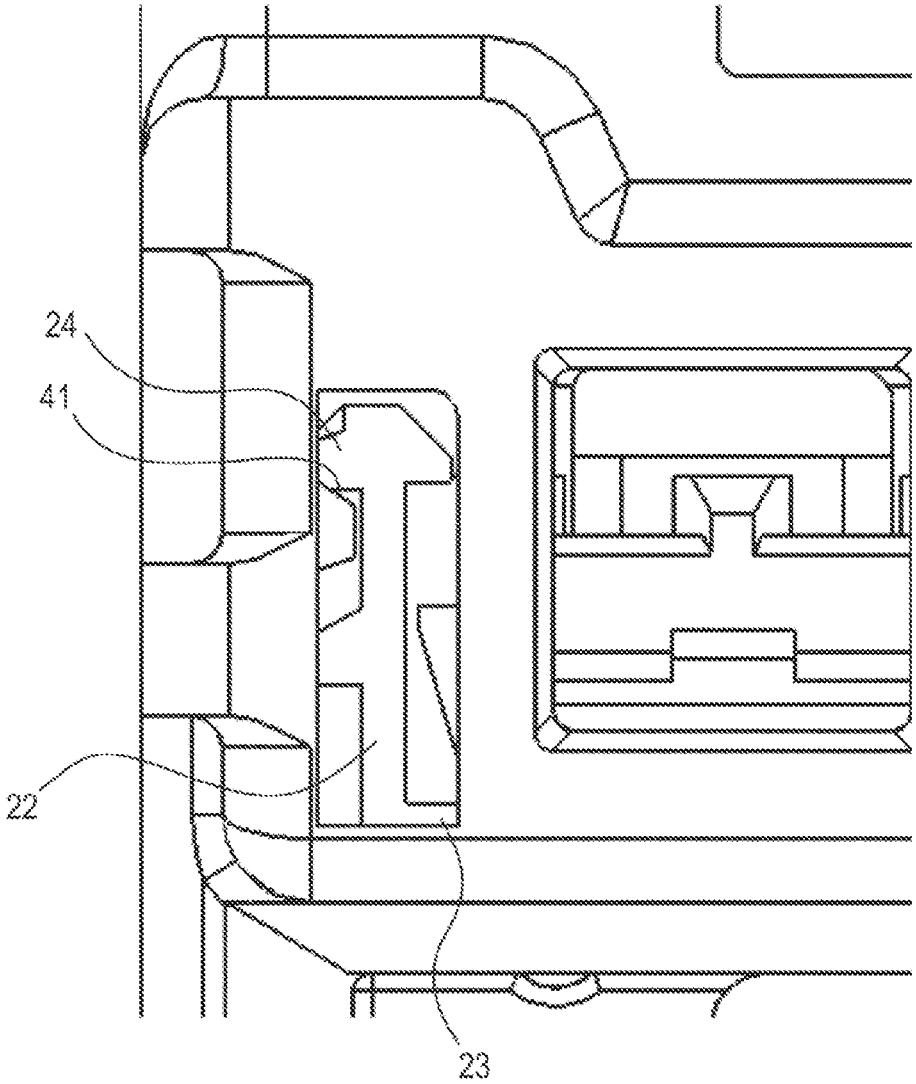


FIG. 11



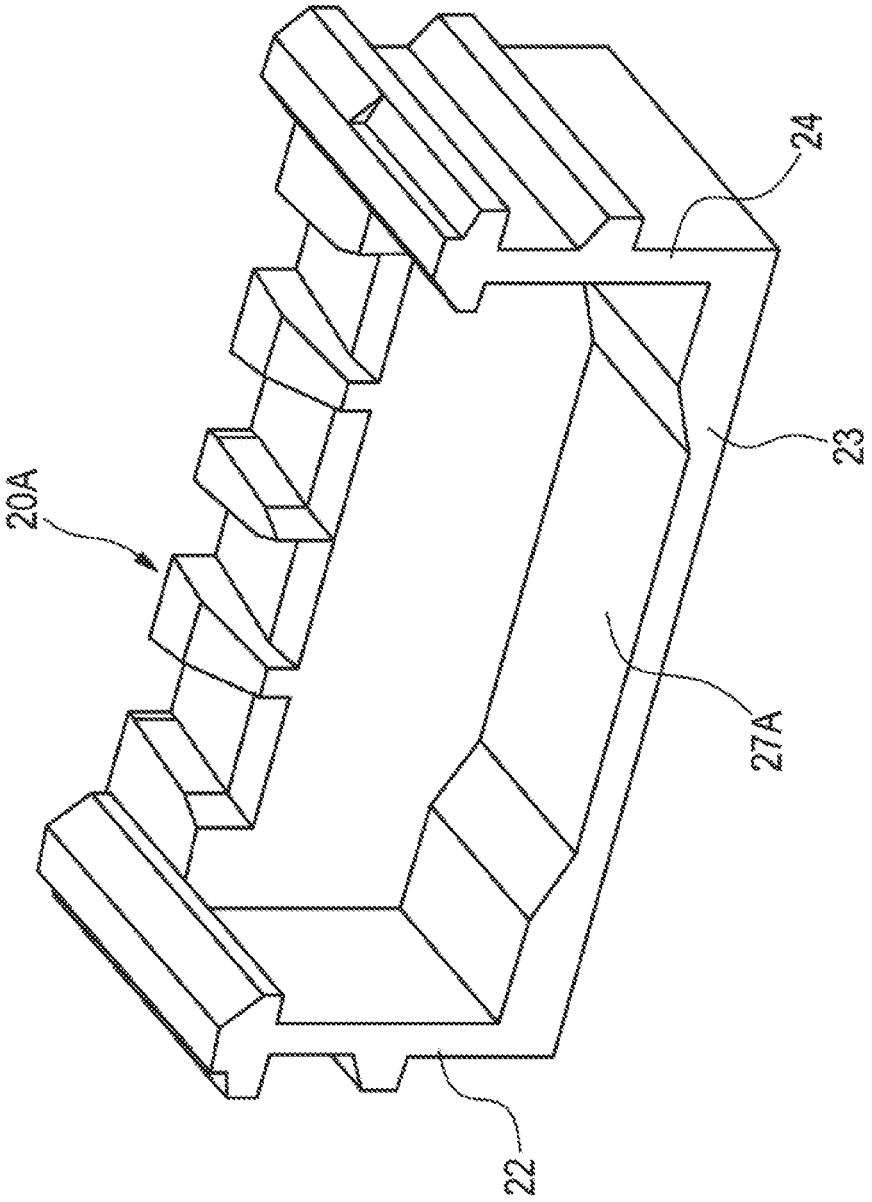


FIG. 12

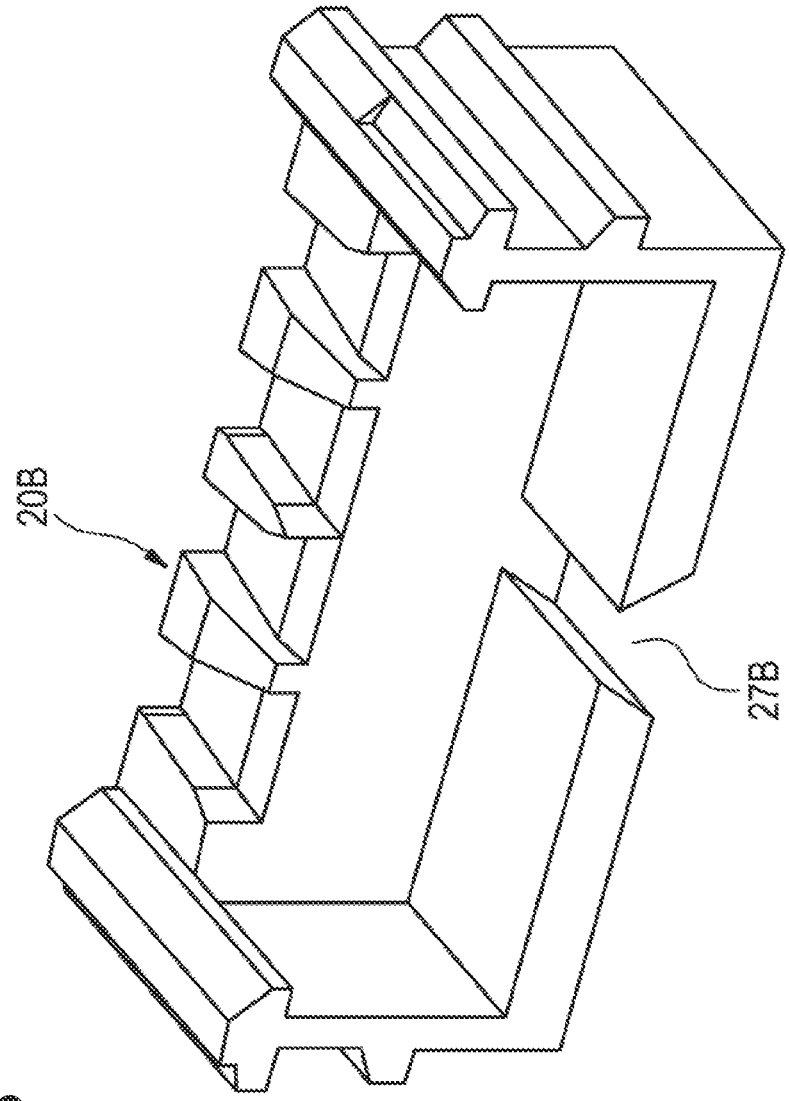


FIG. 13

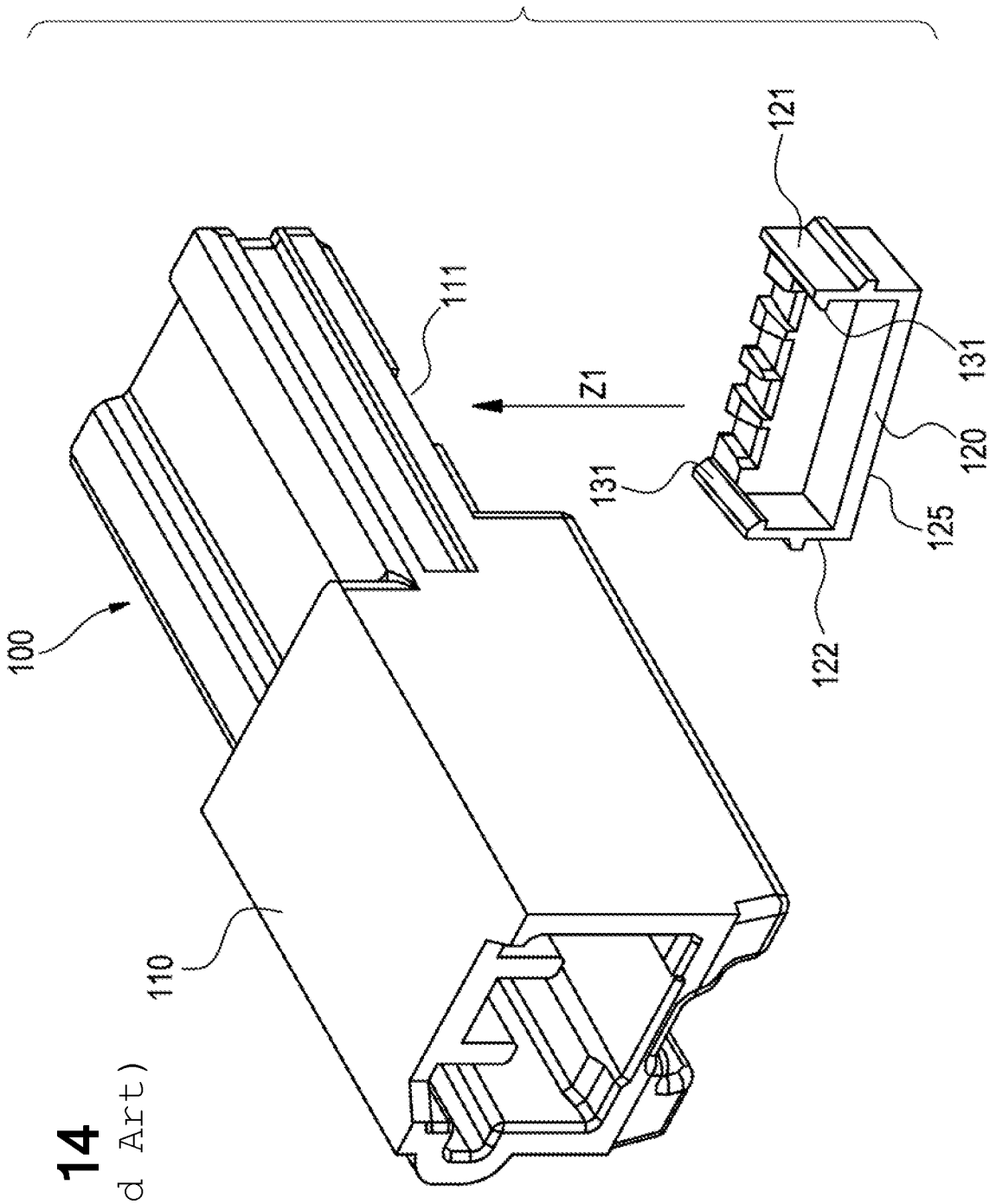


FIG. 14
(Related Art)

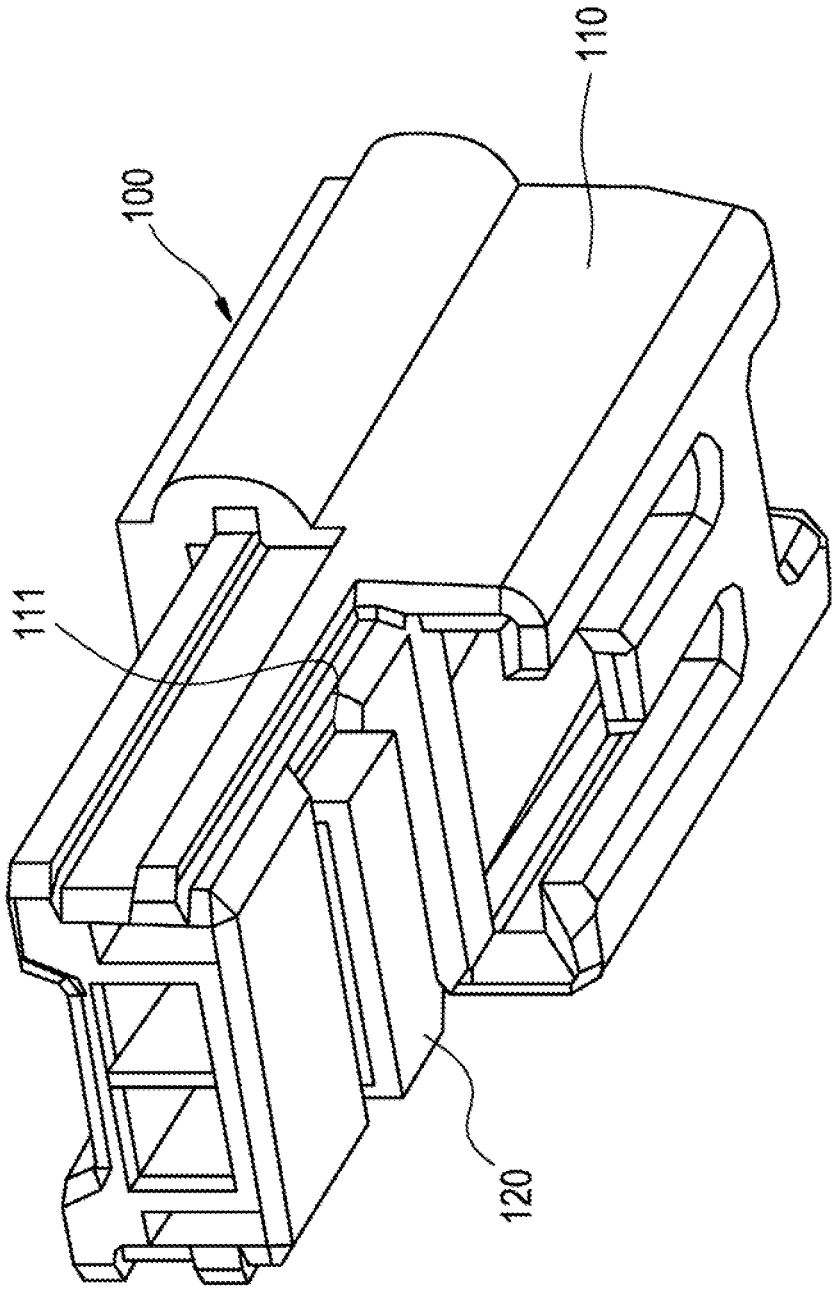


FIG. 15
(Related Art)

FIG. 16
(Related Art)

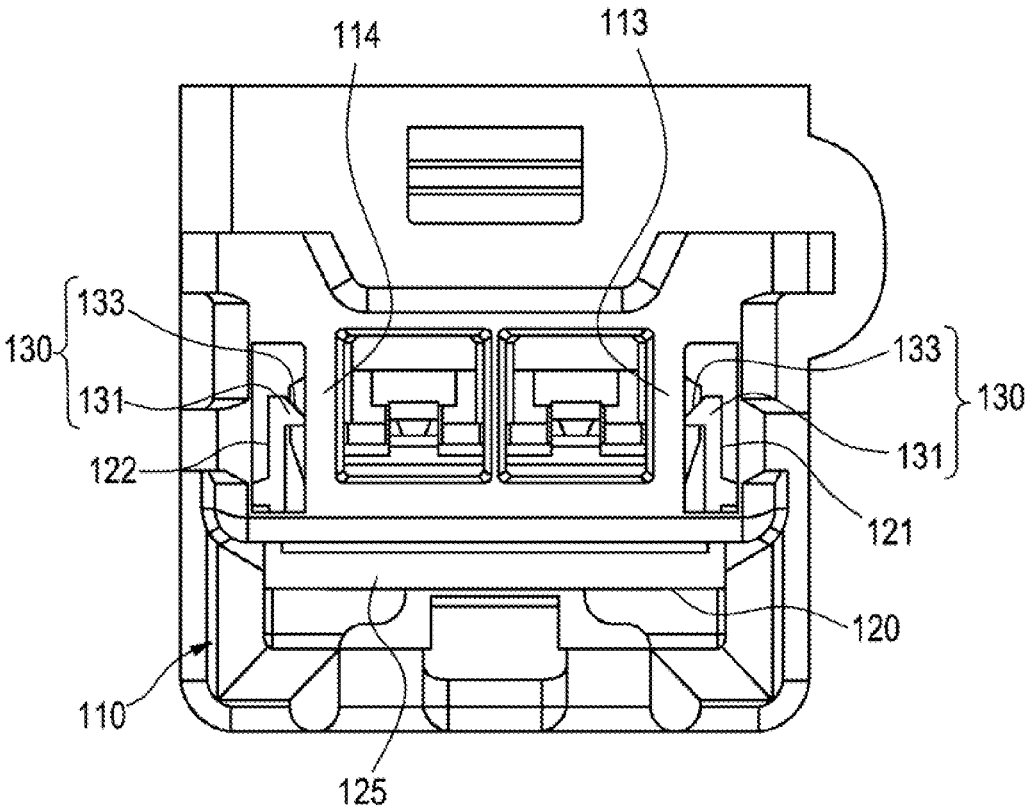
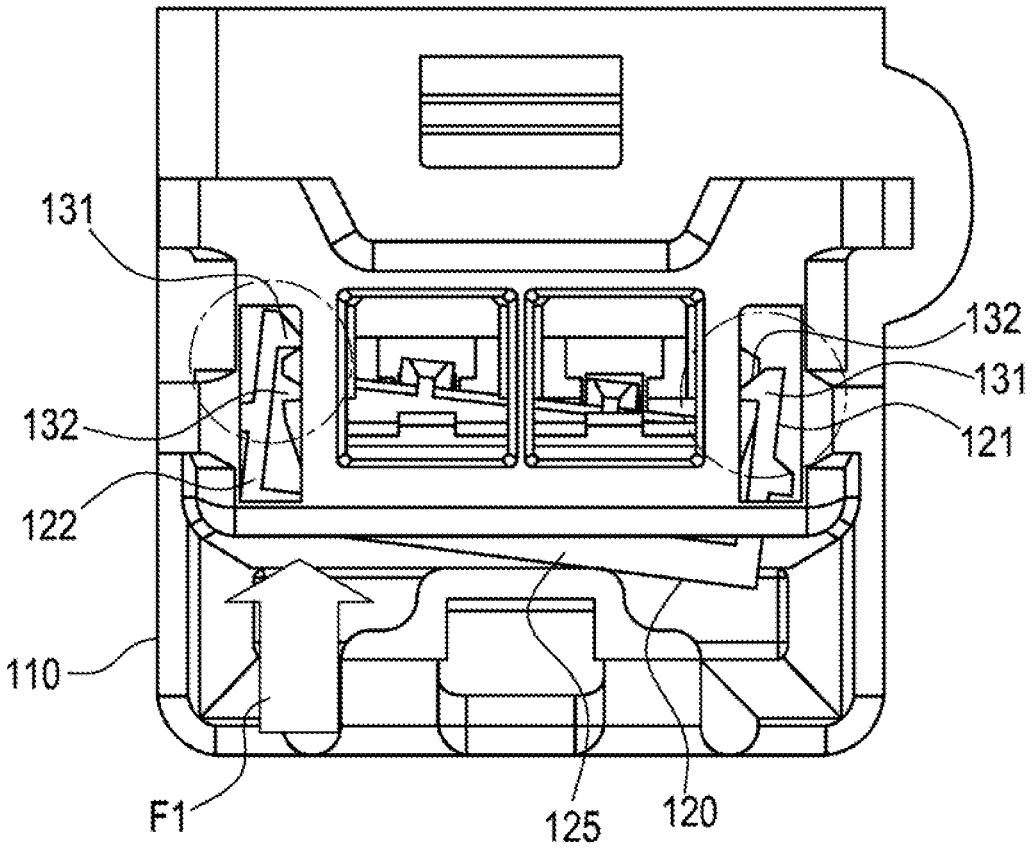


FIG. 17
(Related Art)



CONNECTOR

TECHNICAL FIELD

The present invention relates to a connector including a connector housing for receiving a terminal fitting, and a spacer inserted into a spacer installation opening of the connector housing to prevent the terminal fitting received in the connector housing from being fallen out.

BACKGROUND ART

In order to prevent a terminal fitting received in a connector housing from being fallen out or being poorly fitted, various connectors have been proposed, which have a connector housing for receiving a terminal fitting and a spacer inserted into a spacer installation opening of the connector housing to prevent the terminal fitting received in the connector housing from being fallen out.

FIGS. **14** to **17** show such a connector according to the related art.

A connector **100** shown in the figures, like a connector disclosed in the below PTL1, has a spacer installation opening **111** provided in a lower surface of a connector housing **110**, and a spacer **120** is inserted and installed in the spacer installation opening **111** as indicated by an arrow Z1 in FIG. **14**.

FIGS. **15** and **16** shows a state where the spacer **120** inserted in the spacer installation opening **111** is positioned at a temporary locking position by a temporary locking mechanism **130**.

The temporary locking position is a position, where the spacer **120** is not engaged with a terminal fitting in the connector housing **110**.

The temporary locking mechanism **130** of the shown example, as shown in FIG. **16**, is constituted of a pair of positioning protrusions **131** formed to protrude from front ends of both outside walls **121** and **122** of the spacer **120** opposing with each other in a width direction of the connector housing **110**, and a pair of locking portions **133** provided on the connector housing **110**.

The pair of positioning protrusions **131** are protrusions formed to inwardly protrude from the front ends of both outside walls **121** and **122** of the spacer **120**. In addition, the pair of locking portions **133** are engaging grooves, in which the positioning protrusions **131** are engaged when the spacer **120** has been inserted up to the temporary locking position. The pair of locking portions **133** are provided on inner partition walls **113** and **114** in the connector housing **110**, which are erected in an opposing state inside of the outside walls **121** and **122**.

The spacer **120** can moved from the temporary locking position, as shown in FIGS. **15** and **16**, to the main locking position, where the spacer is engaged with the terminal fitting, if a pressing load equal to or greater than a predetermined value is further exerted thereon.

CITATION LIST

Patent Literature

PTL1: JP-A-2010-40366 A

SUMMARY OF INVENTION

Technical Problem

However, in conventional connectors disclosed in PTL1 and the like, a force for locking the spacer at the temporary locking position is not set so high.

Therefore, when transportation or the like of the connector is performed in a state where the spacer is temporarily locked in the connector housing, if external equipment or the like is erroneously contacted with one end of a rear end wall **125** of the spacer **120** during transportation, there is a risk that, due to an impact force F1 at that time, one end of the spacer **120** would have been inadvertently pushed to the main locking position as shown in FIG. **17**.

In addition, there is a problem in that, if the spacer would have been advertently pushed to the main locking position, a restoration work of returning the spacer **120** to the original temporary locking position is required when the terminal fitting is received in the connector housing **110**, and thus handling properties are poor.

Accordingly, an object of the present invention is to solve the above problems, and to provide a connector, which prevents a spacer inserted into a spacer installation opening of a connector housing from being inadvertently pushed from a temporary locking position to a main locking position due to erroneous contact or the like, and thus has excellent handling properties.

Solution to Problem

The above object of the present invention is achieved by the following configurations.

(1) A connector, including:

a connector housing for receiving a terminal fitting;

a spacer inserted into a spacer installation opening of the connector housing to prevent the terminal fitting received in the connector housing from being fallen out;

a temporary locking mechanism for temporarily fixing the spacer to a temporary locking position where the spacer is not engaged with the terminal fitting; and

a main locking mechanism for locking the spacer, which has been pushed toward a more inner side of the housing than the temporary locking position, to a main locking position where the spacer is engaged with the terminal fitting;

wherein the temporary locking mechanism allows the spacer to move from the temporary locking position to the main locking position, only if a pressing load equal to or greater than a first preset value is acted on a location corresponding to the center in a width direction of a rear end surface of the spacer, and also a pressing load equal to or greater than a second preset value is acted on end portions in the width direction of the rear end surface of the spacer.

(2) The connector according to the above (1), wherein the spacer includes a pair of outside walls arranged on both outside portions opposing with each other in the width direction of the connector housing, and is configured to be bending-deformed in a predetermined inclined state where a width of the spacer is narrowed from the front end toward the rear end, if the pressing load equal to or greater than the first preset value is acted on the location corresponding to the center in the width direction of the rear end surface of the spacer, and positioning protrusions provided to protrude from a location on a front end side of the pair of outside walls outward in the width direction of the connector housing;

the connector housing includes locking protrusions protruding from inner surfaces of the connector housing to allow the positioning protrusions to abut thereon when the spacer has been inserted and advanced from the spacer installation opening to the temporary locking position, and serving as the temporary locking mechanism by abutting against the positioning protrusions; and

the abutting surfaces between the positioning protrusions and the locking protrusions, which position the spacer at the

temporary locking position, are configured so that the positioning protrusions become in a predetermined inclined state, as the pressing load equal to or greater than the first preset value is acted on the location corresponding to the center in the width direction of the rear end surface of the spacer and thus, the pair of outside walls are bending-deformed in the predetermined inclined state, and also so that the inclination angles thereof are set to allow the positioning protrusions to climb over the locking protrusions and move to the main locking position, only if the pressing load equal to or greater than the second preset value is acted in the insertion direction of the spacer on end portions in the width direction of the rear end surface of the spacer.

(3) The connector according to the above (2), wherein the abutting surfaces between the positioning protrusions and the locking protrusions, which position the spacer at the temporary locking position, are inclined so that a position of an inner sides thereof in the width direction of the connector housing is biased forward in an insertion direction of the spacer, and are set to have an acute inclination angle allowing an included angle with respect to a reference plane perpendicular to the insertion direction of the spacer to become less than 45°.

(4) The connector according to any one of the above (1) to (3), wherein a slit is provided on a rear end wall of the spacer connecting between the pair of outside walls to allow the rear end wall to be easily bending-deformed when the pressing load equal to or greater than the first preset value is acted on the location corresponding to the center in the width direction of the rear end surface of the spacer.

(5) The connector according to any one of the above (1) to (4), wherein a tinned portion is provided on the rear end wall of the spacer connecting between the pair of outside walls to allow the rear end wall to be easily bending-deformed when the pressing load equal to or greater than the first preset value is acted on the location corresponding to the center in the width direction of the rear end surface of the spacer.

According to the above configuration (1), the spacer, which has been positioned at the temporary locking position in the connector housing by the temporary locking mechanism, can be moved from the temporary locking position to the main locking position, only if a pressing load equal to or greater than a preset value is acted on each of the center and the end portions of the rear end surface of the spacer.

During transporting or the like, a case in which a pressing load equal to or greater than the preset value is acted on each of the center and the end portions of the rear end surface of the spacer is not occurred. Therefore, there is no case in which the spacer inserted in the spacer installation opening of the connector housing is inadvertently pushed from the temporary locking position to the main locking position due to erroneous contact or the like during transporting or the like.

As a result, when the terminal fitting is received in the connector housing, a restoration work of returning the spacer to the original temporary locking position can be prevented, thereby enhancing handling properties.

According to the above configuration (2), when the location corresponding to the center in the width direction of the rear end surface of the spacer, which has been positioned at the temporary locking position, is pressed, the center of the rear end wall of the spacer providing the rear end surface is bending-deformed in a recessed state, and accompanying with the deformation of the rear end wall, both outside walls of the spacer are bending-deformed in a predetermined inclined state where a width of the spacer is narrowed from the from end toward the rear end. In addition, as both outside walls of the spacer are bending-deformed in the predetermined inclined state, the positioning protrusions provided on both outside walls are abutted against the locking protrusions at an angle steeper than the initial state, and as a result, even if a pressing load acting on the rear end wall of the spacer is small, the positioning protrusions can easily climb over the locking protrusions.

In other words, in a state where the center of the rear end surface of the spacer is not pressed, the positioning protrusions are abutted against the locking protrusions at a gentle angle, and thus, it is necessary to apply a greater pressing load in order to allow the positioning protrusions to climb over the locking protrusions.

Therefore, in a state where the center of the rear end surface of the spacer is not pressed, if an initial inclination angle of the positioning protrusions abutting against the locking protrusions is set so that a pressing load required to allow the positioning protrusions to climb over the locking protrusions **13** is greater than a load acted by erroneous contact during transporting or the like, even when a pressing load due to erroneous contact is acted on any one of the center and the end portions of the rear end surface of the spacer during transporting or the like, a problem in that the spacer is inadvertently moved from the temporary locking position to the main locking position due to erroneous contact can be prevented.

Namely, thanks to the above configuration (2), the technical idea of the above configuration (1) can be realized in which only if a pressing load equal to or greater than a preset load is simultaneously acted on each of the center and the end portions in the width direction of the rear end surface of the spacer, the spacer can be moved from the temporary locking position to the main locking position.

According to the above configuration (3), a force, which is acted between the abutting surfaces of the positioning protrusions and the locking protrusions by a pressing load acted on the rear end surface of the spacer, is such that when an included angle between the abutting surfaces and a reference plane perpendicular to the insertion direction of the spacer is less than 45°, a component in a direction parallel to the abutting surfaces becomes smaller than a component in a direction perpendicular to the abutting surfaces as the included angle becomes smaller, and thus, slip between the abutting surfaces hardly occurs.

Thus, by setting the included angle between the abutting surfaces and the reference plane perpendicular to the insertion direction of the spacer to less than 45' as in the present embodiment, an effect of inhibiting the spacer from being moved from the temporary locking position to the main locking position due to erroneous contact during transporting or the like can be enhanced.

According to the above configuration (4), the rear end wall of the spacer can easily be bending-deformed due to an easily implementable configuration that the rear end wall providing the rear end surface of the spacer is provided with the slit.

Therefore, by pressing the center in the width direction of the spacer, the rear end wall of the spacer can easily be bending-deformed in a desired bended shape in which the central portion hereof is recessed.

According to the above configuration (5), the rear end wall of the spacer can easily be bending-deformed due to an easily implementable configuration that the rear end wall providing the rear end surface of the spacer is provided with the thinned portion.

Therefore, by pressing the center in the width direction of the spacer, the rear end wall of the spacer can easily be bending-deformed in a desired bended shape in which the central portion thereof is recessed.

In the foregoing, the present invention has been briefly described. Also, details of the present invention will be further apparent modes (hereinafter, referred to as) "embodiments") for embodying the invention as described below are thoroughly read with reference to the accompanying drawings.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is an exploded perspective view of one embodiment of a connector according to the present invention.

FIG. **2** is a front view of a connector housing shown in FIG. **1**.

FIG. **3** is a rear view of the connector housing showing a mechanism for locking a spacer in the connector housing shown in FIG. **1**.

FIG. **4** is an enlarged view of a section A shown in FIG. **3**.

FIG. **5** is an enlarged view of the spacer shown in FIG. **1**.

FIG. **6** is a rear view showing a state where the spacer is temporarily fixed to the connector housing shown in FIG. **3**.

FIG. **7** is an enlarged view of a section B in FIG. **6**.

FIG. **8** is an enlarged view showing an engagement state between positioning protrusions and locking protrusions, when both side walls of the spacer are inclined as the central portion in the width direction of the spacer temporarily locked to the connector housing is pressed.

FIG. **9** is a view, as seen from the rear side, showing a state where positioning protrusions starts to climb over the locking protrusions as the central portion and end portions in the width direction of the spacer temporarily locked to the connector housing are respectively pressed.

FIG. **10** is a view, as seen from the rear side, showing a state where a climbing operation of the positioning protrusions over the locking protrusions is near completed as the central portion and the end portions in the width direction of the spacer temporarily locked to the connector housing are respectively pressed.

FIG. **11** is a view, as seen from the rear side, showing a, state where the positioning protrusions have been moved to a main locking position over the locking protrusions as the central portion and the end portions in the width direction of the spacer temporarily locked to the connector housing are respectively pressed.

FIG. **12** is a perspective view of another embodiment of the spacer used in the connector of the present invention.

FIG. **13** is a perspective view of a further embodiment of the spacer used in the connector of the present invention.

FIG. **14** is an exploded perspective view of a connector according to the related art.

FIG. **15** is a perspective view of a state where a spacer is positioned at a temporary locking position in the connector according to the related art.

FIG. **16** is a rear view showing an attachment state of the spacer the connector shown in FIG. **15**.

FIG. **17** is a rear view showing a state where one end side of the spacer of the connector shown in FIG. **15** is moved from the temporary locking position to a main locking position.

DESCRIPTION OF EMBODIMENTS

Preferred embodiments of a connector according to the present invention will be now described in detail with reference to the accompanying drawings.

FIGS. **1** to **11** illustrate one embodiment of a connector according to the present invention, in which FIG. **1** is an exploded perspective view of one embodiment of the connector; FIG. **2** is a front view of a connector housing shown in FIG. **1**; FIG. **3** is a rear view of the connector housing showing a mechanism for locking a spacer in the connector housing shown in FIG. **1**; FIG. **4** is an enlarged view of a section A shown in FIG. **3**; FIG. **5** is an enlarged view of the spacer shown in FIG. **1**; FIG. **6** is a rear view showing a state where the spacer is temporarily fixed to the connector housing shown in FIG. **3**; FIG. **7** is an enlarged view of a section B in FIG. **6**; FIG. **8** is an enlarged view showing an engagement state between a positioning protrusions and locking protrusions, when both side walls of the spacer are inclined as the central portion in the width direction of the spacer temporarily locked to the connector housing is pressed; FIG. **9** is a view, as seen from the rear side, showing a state where the positioning protrusions start to climb over the locking protrusions as the central portion and end portions in the width direction of the spacer temporarily locked to the connector housing are respectively pressed; FIG. **10** is a view, as seen from the rear side, showing a state where a climbing operation of the positioning protrusions over the locking protrusions is near completed as the central portion and the end portions in the width direction of the spacer temporarily locked to the connector housing are respectively pressed; and FIG. **11** is a view, as seen from the rear side, showing a state where the positioning protrusions have been moved to a main locking position over the locking protrusions as the central portion and the end portions in the width direction of the spacer temporarily locked to the connector housing are respectively pressed.

As shown in FIGS. **1** to **3**, the connector **1** according to the embodiment includes a connector housing **10** for receiving a terminal fitting (not shown); a spacer **20** inserted into a spacer installation opening **11** of the connector housing **10** to prevent the terminal fitting received in the connector housing **10** from being fallen out; a temporary locking mechanism **30** for temporarily fixing the spacer **20** to a temporary locking position where the spacer **20** is not engaged with the terminal fitting; and a main locking mechanism **40** for locking the spacer **20**, which has been pushed toward a more inner side of the housing than the temporary locking position, to a main locking position where the spacer **20** is engaged with the terminal fitting.

As shown in FIG. **1**, the connector housing **10** has, in a lower surface thereof, the spacer installation opening **11** at a location slightly toward a rear end thereof. The spacer **20** is installed in the connector housing **10** by inserting into the spacer installation opening **11** along a direction of an arrow Z**2** shown in FIG. **1**.

As shown FIGS. **3** and **4**, a first locking protrusion **13** and a second locking protrusion **14** are provided on an inner portion of the spacer installation opening **11** of the connector housing **10**.

The first locking protrusion as shown FIGS. **3** and **4**, is formed to protrude inward from a pair of inner surfaces **10***a* and **10***b* opposing to both outer surfaces **21***a* and **22***a* (see FIG. **5**) the width direction of the spacer **20** inserted in the spacer installation opening **11**.

As shown in FIG. **4**, the first locking protrusion **13** has a temporary locking tapered surface **31** on a lower side thereof, and a main locking tapered surface **41** on an upper side thereof.

The temporary locking tapered surface **31** is a tapered surface facing the spacer installation opening **11**. The temporary locking tapered surface **31** is inclined so that an position of an inner side thereof in the width direction of the connector housing **10** is biased forward in an insertion direction (the direction of the arrow Z**2** in FIG. **1**) of the spacer **20**, and is set to have an acute inclination angle allowing an included angle

θ with respect to a reference plane M1 (see FIG. **4**) perpendicular to the insertion direction of the spacer **20** to become less than 45°.

The temporary locking tapered surface **31** abuts against a positioning protrusion **24**, as described below, when the spacer **20** has been inserted and advanced from the spacer installation opening **11** to the temporary locking position, thereby restricting the positioning protrusion **24** from further advancing in the insertion direction.

The second locking protrusion **14** is formed to protrude from outward side surfaces **10***c* and **10***d* which are provided inside the housing to oppose the inner surfaces **10***a* and **10***b* at a more inner side of the housing than the inner surfaces **10***a* and **10***b*. A top end surface of the second locking protrusion **14** engages with an inward protrusion **25** of the spacer **20** when the spacer **20** has been advanced to the temporary locking position, and thus becomes a return restricting surface **32** for restricting the spacer **20** from being returned toward the spacer installation opening **11**.

The temporary locking tapered surface **31** and the return restricting surface **32** serve as the temporary locking mechanism **30** for positioning the spacer **20** at the temporary locking position.

The main locking tapered surface **41** of the first locking protrusion **13** locks a rear end surface of the positioning protrusion **24** of the spacer **20**, when the positioning protrusion **24** has climbed over the first locking protrusion **13**, and thus servers as the main locking mechanism **40** for fixing the spacer **20** to the main locking position.

As shown in FIGS. **5** to **7**, the spacer **20** includes a pair of outside walls **21** and **22** arranged on both outside portions opposing with each other in the width direction of the connector housing **10**; a rear end wall **23** connecting between the pair of outside walls **21** and **22**; the positioning protrusion **24** provided to protrude from a location on a front end side of each of the pair of outside walls **21** and **22** outward in the width direction of the connector housing **10**; the inward protrusion **25** provided to protrude from a location on a front end side of each of the pair of outside walls **21** and **22** inward in the width direction of the connector housing **10**; a guide protrusion **26** provided to protrude from a location on a rear end side of each of the pair of outside walls **21** and **22** outward in the width direction of the connector housing **10**; and a fitting locking portion for restricting the terminal fitting from being fallen out when the spacer **20** has been positioned at the main locking position.

As shown in FIG. **6**, the pair of outside walls **21** and **22** are configured to be bending-deformed in a predetermined inclined state where a width of the spacer **20** is narrowed from the front end toward the rear end, if a pressing load G**1** equal to or greater than a first preset value is acted on a location corresponding to the center in a width direction of the rear end surface of the spacer **20**. FIG. **8** shows a state where the outside wall **22** of the spacer **20** is bending-deformed in the predetermined inclined state by action of a pressing load G**1** in FIG. **6**.

As shown in FIG. **8**, if the outside wall **22** become in the predetermined inclined state, the positioning protrusion **24** formed to protrude from the front end of the outside wall **22** is pivoted in a direction of an arrow R**1** in FIG. **8**, and is abutted against the first locking protrusion **13** at an angle steeper than the initial state.

The rear end wall **23** of the spacer **20** is provided with a slit **27** allowing the rear end wall **23** to be easily bending-deformed in a state where the center thereof is recessed, when the pressing load G**1** equal to or greater than the first preset value is acted on a location corresponding to the center in the width direction of the rear end surface of the spacer **20**.

In the present embodiment, two slit **27** are provided as shown in FIG. **5**.

When the spacer **20** inserted into the spacer installation opening **11** has been advanced to the temporary locking position, the positioning protrusion **24**, as shown in FIGS. **6** and **7**, abuts against the temporary locking tapered surface **31** of the first locking protrusion **13** in the housing, thereby restricting the spacer from being further advanced into the housing. When the positioning protrusion **24** has abutted against the temporary locking tapered surface **31**, a rear end surface of the inward protrusion **25**, as shown in FIG. **7**, is locked on the second locking protrusion **14**, thereby also restricting the spacer **20** from being returned toward the space installation opening **11**.

Namely, the rear end wall **23** and the inward protrusion **25** are cooperated with the temporary locking tapered surface **31** and the return restricting surface **32**, thereby serving as the temporary locking mechanism **30** for positioning the spacer **20** at the temporary locking position.

An abutting surface of the positioning protrusion **24**, which abuts against the temporary locking tapered surface **31** of the first locking protrusion **13** when the spacer **20** has been advanced to the temporary locking position, is set to have the same inclination as that of the temporary locking tapered surface **31**. Namely, the abutting surface of the positioning protrusion **24**, which abuts against the temporary locking tapered surface **31** of the first locking protrusion **13** is inclined so that an position of an inner side thereof in the width direction of the connector housing **10** is biased forward in the insertion direction of the spacer **20**, and is set to have an acute inclination angle allowing an included angle with respect to a reference plane perpendicular to the insertion direction of the spacer **20** to become less than 45°.

The guide protrusions **26**, as shown in FIGS. **6** and **7**, slide on and along the inner surfaces **10***a* and **10***b* inside the connector housing **10** when the spacer **20** has been inserted in the spacer installation opening **11**, and restrict the outside walls **21** and **22** from being fallen down outward in the width direction.

The temporary locking mechanism **30** of the connector **1** as described above is configured so that the angles of the temporary locking surface **31** and the abutting surface of the positioning protrusion **24** are set to allow the spacer **20** to move from the temporary locking position to the main locking position, only if the pressing load G**1** equal to or greater than the first preset value is acted on a location corresponding to the center in the width direction of the rear end surface of the spacer **20**, and also a pressing load G**2** equal to or greater than a second preset value is acted on end portions in the width direction of the rear end surface of the spacer **20**.

More specifically, in the connector **1** according to the present embodiment, the abutting surfaces between the positioning protrusion **24** and the first locking protrusion **13**, which position the spacer **20** at the temporary locking position, are configured so that the positioning protrusion **24** becomes in a predetermined inclined state, as the pressing load G**1** equal to or greater than the first preset value is acted on a location corresponding to the center in the width direction of the rear end surface of the spacer **20** and thus, as shown in FIG. **8**, the pair of outside walls **21** and **22** are bending-deformed in the predetermined inclined state. Additionally, in this state, the inclination angles of the abutting surfaces between the positioning protrusion **24** and the first locking protrusion **13** are set to allow the positioning protrusion **24** to climb over the first locking protrusion **13** and move to the

main locking position as shown in FIGS. **9** to **11**, only if the pressing load G**2** equal to or greater than the second preset value is acted in the insertion direction of the spacer **20** on end portions in the width direction of the rear end surface of the spacer **20** as shown in FIG. **7**.

According to the connector **1** of the one embodiment as described above, the spacer **20**, which has been positioned at the temporary locking position in the connector housing **10** by the temporary locking mechanism **30**, can be moved from the temporary locking position to the main locking position, only if a pressing load equal to or greater than a preset value is acted on each of the center and the end portions of the rear end surface of the spacer **20**.

During transporting or the like, a case in which a pressing load equal to or greater than the preset value is acted on each of the center and the end portions of the rear end surface of the spacer **20** is not occurred. Therefore, there is no case in which the spacer **20** held at the temporary locking position by the temporary locking mechanism **30** is inadvertently pushed from the temporary locking position to the main locking position due to erroneous contact or the like during transporting or the like.

As a result, when the terminal fitting is received in the connector housing **10**, a restoration work of returning the spacer **20** to the original temporary locking position can be prevented, thereby enhancing handling properties.

Also, according to the connector **1** of the one embodiment, when the location corresponding to the center in the width direction of the rear end surface of the spacer **20**, which has been positioned at the temporary locking position, is pressed, the center of the rear end wall **23** of the spacer **20** providing the rear end surface is bending-deformed in a recessed state as shown in FIG. **8**, and accompanying with the deformation of the rear end wall **23**, both outside walls **21** and **22** of the spacer **20** are bending-deformed in a predetermined inclined state where a width of the spacer **20** is narrowed from the front end toward the rear end.

In addition, as both outside walls **21** and **22** of the spacer **20** are bending-deformed in the predetermined inclined state, the positioning protrusion **24** provided on each of both outside walls **21** and **22** is abutted against the first locking protrusion **13** at an angle steeper than the initial state, and as a result, even if a pressing load acting on the rear end wall **23** of the spacer **20** is small, the positioning protrusion **24** can easily climb over the first locking protrusion **13**.

In other words, in a state where the center of the rear end surface of the spacer **20** is not pressed, the positioning protrusion **24** is abutted against the first locking protrusion **13** at a gentle angle, and thus, it is necessary to apply a greater pressing load in order to allow the positioning protrusion **24** to climb over the first locking protrusion **13**.

Therefore, in a state where the center of the rear end surface of the spacer **20** is not pressed, if an initial inclination angle of the positioning protrusion **24** abutting against the first locking protrusion **13** is set so that a pressing load required to allow the positioning protrusion **24** to climb over the first locking protrusion **13** is greater than a load acted by erroneous contact during transporting or the like, even when a pressing load due to erroneous contact is acted on any one of the center and the end portions of the rear end surface of the spacer **20** during transporting or the like, a problem in which the spacer **20** is inadvertently moved from the temporary locking position to the main locking position due to erroneous contact can be prevented.

Namely, thanks to the connector **1** of the one embodiment, the technical idea of the prose invention can be realized in which only if a pressing load equal to or greater than a preset load is simultaneously acted on each of the center and the end portions in the width direction of the rear end surface of the spacer **20**, the spacer **20** can be moved from the temporary locking position to the main locking position.

Further, according to the connector **1** of the one embodiment, a force, which is acted between the abutting surfaces of the positioning protrusion **24** and the first locking protrusion **13** by a pressing load (F in FIG. **4**) acted on the rear end surface of the spacer **20**, is such that when an included angle between the abutting surfaces and a reference plane perpendicular to the insertion direction of the spacer **20** is less than 45°, a component (Fh in FIG. **4**) in a direction parallel to the abutting surfaces becomes smaller than a component (Fv in FIG. **4**) in a direction perpendicular to the abutting surfaces as the included angle becomes smaller, and thus, slip between the abutting surfaces hardly occurs.

Thus, by setting the included angle between the abutting surfaces and the reference plane perpendicular to the insertion direction of the spacer **20** to less than 45° as in the present embodiment, an effect of inhibiting the spacer **20** from being moved from the temporary locking position to the main locking position due to erroneous contact during transporting or the like can be enhanced.

In addition, according to the connector **1** of the one embodiment, the rear end wall **23** of the spacer **20** can easily be bending-deformed due to an easily implementable configuration that the rear end wall **23** providing the rear end surface of the spacer **20** is provided with the slit **27**.

Therefore, by pressing the center in the width direction of the spacer **20**, the rear end wall **23** of the spacer **20** can easily be bending-deformed in a desired bended shape in which the central portion thereof is recessed.

Meanwhile, the connector according to the present invention is not limited to the foregoing embodiment, but appropriate changes, modifications or the like thereof can be made.

For example, a means for allowing the rear end wall to be easily bending-deformed when a pressing load equal to or greater than the first preset value is acted on the location corresponding to the center in the width direction of the rear end surface of the spacer is not limited to the foregoing embodiment.

For example, in a spacer **20**A shown in FIG. **12**, instead of the slit **27** as described in the one embodiment, a thinned portion **27**A is provided as a means for allowing the rear end wall **23** to be easily bending-deformed.

According to the configuration shown in FIG. **2**, the rear end wall **23** of the spacer **20** can easily be bending-deformed due to an easily implementable configuration that the rear end wall **23** providing the rear end surface of the spacer **20** is provided with the thinned portion **27**A.

Therefore, by pressing the center in the width direction of the spacer **20**A, the rear end wall **23** of the spacer **20**A can easily be bending-deformed in a desired bended shape in which the central portion thereof is recessed.

In addition, when the rear end wall is provided with the slit as a means for allowing the rear end wall of the spacer to be easily bending-deformed, the number or the specific shape of the slit provided is not limited to the foregoing embodiment.

For example, in a spacer **20**B shown in FIG. **13**, instead of two slit **27** as described in the one embodiment, one slit **27**B having a cross-sectional shape different from that of the one embodiment is provided as a means for allowing the rear end wall **23** to be easily bending-deformed.

As described above, by modifying the cross-sectional shape or the number of the slit provided in the rear end wall, bending characteristics of the rear end wall of the spacer may be adjusted.

The present invention is not limited to the foregoing embodiments, but appropriate changes, modifications or the like thereof can be made. In addition, material, shape, dimension, number, installation position and the like of each of the components of the foregoing embodiment are not limited but arbitrary as long as the present invention can be achieved.

Although the present invention has been described with referenced to the detailed and specific embodiment, it should be apparent to those skilled in the art that numerous changes and modifications can be made without departing the scope and spirit of the present invention.

This application claims the benefit of Japanese Patent Application Serial No, 2011-140766 filed on June 2011, the entire contents of which are incorporated herein by reference.

Here, features of embodiments of the connector according to the present invention will be respectively briefly summarized and listed in the following [1] to [5].

[1] A connector (**1**), including:

a connector housing (**10**) for receiving a terminal fitting;

a spacer (**20**, **20**A, **20**B) inserted into a spacer installation opening (**11**) of the connector housing (**10**) to prevent the terminal fitting received in the connector housing (**10**) from being fallen out;

a temporary locking mechanism (**30**) for temporarily fixing the spacer (**20**, **20**A, **20**B) to a temporary locking position where the spacer (**20**, **20**A, **20**B) is not engaged with the terminal fitting; and

a main locking mechanism (**40**) for locking the spacer (**20**, **20**A, **20**B), which has been pushed toward a more inner side of the housing than the temporary locking position, to a main locking position where the spacer (**20**, **20**A, **20**B) is engaged with the terminal fitting;

wherein the temporary locking mechanism (**30**) allows the spacer (**20**, **20**A, **20**B) to move from the temporary locking position to the main locking position, only if a pressing load (G**1**) equal to or greater than a first preset value is acted on a location corresponding to the center in a width direction of a rear end surface of the spacer (**20**, **20**A, **20**B), and also a pressing load (G**2**) equal to or greater than a second preset value is acted on end portions in the width direction of the rear end surface of the spacer (**20**, **20**A, **20**B).

[2] The connector (**1**) according to the above [1], wherein the spacer (**20**, **20**A, **20**B) includes a pair of outside walls (**21**, **22**) arranged on both outside portions opposing with each other in the width direction of the connector housing (**10**), and is configured to be bending-deformed in a predetermined inclined state where a width of the spacer (**20**, **20**A, **20**B) is narrowed from the front end toward the rear end, if the pressing load (G**1**) equal to or greater than the first preset value is acted on the location corresponding to the center in the width direction of the rear end surface of the spacer (**20**, **20**A, **20**B), and positioning protrusions (**24**) provided to protrude from a location on a front end side of the pair of outside walls (**21**, **22**) outward in the width direction of the connector housing (**10**);

the connector housing (**10**) includes locking protrusions (**13**) protruding from inner surfaces of the connector housing (**10**) to allow the positioning protrusions (**24**) to abut thereon when the spacer (**20**, **20**A, **20**B) has been inserted and advanced from the spacer installation opening (**11**) to the temporary locking position, and serving as the temporary locking mechanism (**30**) by abutting against the positioning protrusions (**24**); and

the abutting surfaces between the positioning protrusions (**24**) and the locking protrusions (**13**), which position the spacer (**20**, **20**A, **20**B) at the temporary locking position, are configured so that the positioning protrusions (**24**) become in a predetermined inclined state, as the pressing load (G**1**) equal to or greater than the first preset value is acted on the location corresponding to the center in the width direction of the rear end surface of the spacer (**20**, **20**A, **20**B) and thus, the pair of outside walls (**21**, **22**) are bending-deformed in the predetermined inclined state, and also so that the inclination angles (θ) thereof are set to allow the positioning protrusions (**24**) to climb over the locking protrusions (**13**) and move to the main locking position, only if the pressing load (G**2**) equal to or greater than the second preset value is acted in the insertion direction of the spacer (**20**, **20**A, **20**B) on end portions in the width direction of the rear end surface of the spacer (**20**, **20**A, **20**B).

[3] The connector (**1**) according to the above [2], wherein the abutting surfaces between the positioning protrusions (**24**) and the locking protrusions (**13**), which position the spacer (**20**, **20**A, **20**B) at the temporary locking position, are inclined so that a position of an inner sides thereof in the width direction of the connector housing (**10**) is biased forward in an insertion direction of the spacer (**20**, **20**A, **20**B), and are set to have an acute inclination angle allowing an included angle (θ) with respect to a reference plane (M**1**) perpendicular to the insertion direction of the spacer (**20**, **20**A, **20**B) to become less than 45'.

[4] The connector **1**) according to any one of the above [1] to [3], wherein a slit (**27**B) is provided on a rear end wall (**23**) of the spacer (**20**, **20**A, **20**B) connecting between the pair of outside walls (**21**, **22**) to allow the rear end wall (**23**) to be easily bending-deformed when the pressing load (G**1**) equal to or greater than the first preset value is acted on the location corresponding to the center in the width direction of the rear end surface of the spacer (**20**, **20**A, **20**B).

[5] The connector (**1**) according to any one of the above [1] to [4], wherein a tinned portion (**27**A) is provided on the rear end wall (**23**) of the spacer (**20**, **20**A, **20**B) connecting between the pair of outside walls (**21**, **22**) to allow the rear end wall (**23**) to be easily bending-deformed when the pressing load (G**1**) equal to or greater than the first preset value is acted on the location corresponding to the center in the width direction of the rear end surface of the spacer (**20**, **20**A, **20**B).

INDUSTRIAL APPLICABILITY

According to the connector of the present in on, the spacer, which has been positioned at the temporary locking position in the connector housing by the temporary locking mechanism, can be moved from the temporary locking position to the main locking position, only if a pressing load equal to or greater than a preset value is acted on each of the center and the end portions of the rear end surface of the spacer.

During transporting or the like, a case in which a pressing load equal to or greater than the preset value is acted on each of the center and the end portions of the rear end surface of the spacer is not occurred. Therefore, there is no case in which the spacer inserted in the spacer installation opening of the connector housing is inadvertently pushed from the temporary locking position to the main locking position due to erroneous contact or the like during transporting or the like.

As a result, when the terminal fitting is received in the connector housing, a restoration work of returning the spacer to the original temporary locking position can be prevented, thereby enhancing handling properties.

REFERENCE NUMERALS LIST

1 Connector
10 Connector housing
11 Spacer installation opening

13 First locking protrusion (Locking protrusion)
14 First locking protrusion (Locking protrusion)
20, **20**A, **20**B Spacer
21, **22** Outside wall
24 Positioning protrusion
25 Inward protrusion
27, **27**A Slit
30 Temporary locking mechanism
31 Temporary locking tapered surface
40 Main locking mechanism
41 Main locking tapered surface
G**1** Pressing load

The invention claimed is:

1. A connector, comprising:

a connector housing that receives a terminal fitting;

a spacer that is inserted into a spacer installation opening of the connector housing to prevent the terminal fitting received in the connector housing from being fallen out;

a temporary locking mechanism that temporarily fixes the spacer to a temporary locking position where the spacer is not engaged with the terminal fitting; and

a main locking mechanism that locks the spacer pushed toward a more inner side of the housing than the temporary locking position to a main locking position where the spacer is engaged with the terminal fitting,

wherein the temporary locking mechanism allows the spacer to move from the temporary locking position to the main locking position, when a pressing load equal to or greater than a first preset value is acted on a location corresponding to the center in a width direction of a rear end surface of the spacer and a pressing load equal to or greater than a second preset value is acted on end portions in the width direction of the rear end surface of the spacer, and

wherein the spacer includes a pair of outside walls arranged on both outside portions opposing with each other in the width direction of the connector housing, and is configured to be bending-deformed in a predetermined inclined state where a width of the spacer is narrowed from the front end toward the rear end, if the pressing load equal to or greater than the first preset value is acted on the location corresponding to the center in the width direction of the rear end surface of the spacer, and positioning protrusions provided to protrude from a location on a front end side of the pair of outside walls outward in the width direction of the connector housing;

the connector housing includes locking protrusions protruding from inner surfaces of the connector housing to allow the positioning protrusions to abut thereon when the spacer has been inserted and advanced from the spacer installation opening to the temporary locking position, and serving as the temporary locking mechanism by abutting against the positioning protrusions; and

the abutting surfaces between the positioning protrusions and the locking protrusions, which position the spacer at the temporary locking position, are configured so that the positioning protrusions become in a predetermined inclined state, as the pressing load equal to or greater than the first preset value is acted on the location corresponding to the center in the width direction of the rear end surface of the spacer and thus, the pair of outside walls are bending-deformed in the predetermined inclined state, and also so that the inclination angles of are set to allow the positioning protrusions to climb over the locking protrusions and move to the main locking position, only if the pressing load equal to or greater than the second preset value is acted in the insertion direction of the spacer on end portions in the width direction of the rear end surface of the spacer.

2. The connector according to claim **1**, wherein the abutting surfaces between the positioning protrusions and the locking protrusions, which position the spacer at the temporary locking position, are set so that a position of an inner sides thereof in the width direction of the connector housing is headed to an insertion direction of the spacer, and are set to have an acute inclination angle allowing an included angle with respect to a reference plane perpendicular to the insertion direction of the spacer to become less than 45°.

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